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REPORT BY THE

Comptroller General

OF THE UNITED STATES

COMPLETED 62

ORIGINAL

Problems In Managing And Planning Of Information Resources Persist At The Army Corps Of Engineers

Weak planning and control have led to ineffective and inefficient management, acquisition, and use of information resources by the Army Corps of Engineers. These management problems have affected a major computer hardware replacement program, causing delays in obtaining needed computer resources. With an estimated life-cycle cost exceeding $1 billion over the next several years in this program, the Corps needs to establish a stronger management structure.

By adhering to the intent of the Paperwork Reduction Act of 1980, the Corps can establish a framework for strengthening its management of information resources.

GAO's principal recommendation is that the Corps establish a central management office headed by a senior official to provide needed direction and leadership and to correct persistent management deficiencies.

GAO/CED-82-28
JUNE 9, 1982

I

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-206854

The Honorable Tom Bevill
Chairman, Subcommittee on
Energy and Water Development
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

As requested in your January 23, 1981, letter, we reviewed the Army Corps of Engineers' effectiveness in planning, acquiring, managing and using information resources, specifically, automatic data processing (ADP).

Our report discloses management and planning deficiencies which hinder the Corps' effectiveness in applying information--ADP--resources and contains recommendations which should improve Corps operations in the immediate future and over the long term.

We are sending copies of this report to the Secretary of Defense; the Secretary of the Army; the Chief of Engineers, Army Corps of Engineers; the Director, Office of Management and Budget; the Administrator, General Services Administration; and other interested parties.

Sincerely yours,

Charles A. Bowsher

Comptroller General
of the United States

III

REPORT BY THE
COMPTROLLER GENERAL
OF THE UNITED STATES

PROBLEMS IN MANAGING AND PLANNING OF INFORMATION RESOURCES PERSIST AT THE ARMY CORPS OF ENGINEERS

D I G E S T

The Corps has experienced numerous problems in managing, acquiring, and using its automatic data processing--information--resources. Its organizational structure and management approach have a number of weaknesses, including the lack of

--a single focus of responsibility or coherent system for managing information resources;

--a formal oversight mechanism to ensure effective and efficient management and use of information systems and computer software (see pp. 7 and 8);

--an enforcement mechanism for controlling and coordinating the development of software applications (see pp. 10 to 15);

--a comprehensive planning process to help manage, acquire, and use information resources (see pp. 15 to 19); and

--a uniform method for evaluating the use and performance of computers and related information resources (see p. 19).

The Corps has become increasingly dependent on information resources--computers and telecommunications, software systems, and personnel--to accomplish its mission and program objectives. It uses approximately 300 computer-based information systems to support administrative functions and over 10,000 computer-based applications to aid scientists and engineers in structural and architectural designs, research projects, and problem solving. (See p. 2.)

Because of planning and management problems, a major computer hardware replacement program known as CE-80 has encountered difficulties since its inception in 1974. These problems also resulted in many funding delays and disapprovals. Further, acquisitions under this replacement program have yet to begin. In the interim, the Corps has had to meet its

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data processing requirements through ineffective and inefficient approaches. The CE-80 program is likely to face continuing problems unless the Corps develops a comprehensive structure to manage the program and produces adequate planning documents. (See p. 28.)

GAO conducted this review at the request of the Chairman, Subcommittee on Energy and Water Development, House Committee on Appropriations, which was concerned that the Corps was not adequately acquiring, planning, managing, and using information resources.

A COMPREHENSIVE MANAGEMENT PROGRAM IS LACKING

The Corps' information resources are dispersed worldwide and are critical to meeting its missions and programs. Yet, Corps management has not provided needed direction and leadership. A central office for implementing a comprehensive management program for information resources is needed to guide this highly decentralized agency. This program should improve the management and use of automatic data processing--information--resources to meet the Corps' information needs.

GAO believes that the Paperwork Reduction Act of 1980 offers the Corps an appropriate framework for strengthening its management of information resources, including automatic data processing. This act calls for increased accountability and authority and responsibility for effective and efficient information resource management.

To correct longstanding management weaknesses, the Corps should have a strong central management office for information resources. During GAO's review, the Corps initiated actions that should help improve the management of needed information. It completed a study which identified actions for establishing a management structure for information-related activities, and it initiated steps to correct some planning problems associated with a major computer acquisition program. (See p. 23.)

GAO recommends that the Secretary of the Army direct the Chief of Engineers to:

--Establish a separate information resource management office with clearly defined authority over information resource activities. This office should include the functions of the Information Resource Management Office, the Automation Management Office, and the CE-80 Project Office.

--Direct the recently designated senior official for information resource management to develop and implement a comprehensive program for managing the Corps' information resources. This program should address the planning and management of those resources that support program needs.

--Establish a comprehensive planning process for information resources, including automatic data processing. This process should provide a mechanism to (1) establish strategies, goals, and objectives, (2) identify and define functional information requirements, (3) establish priorities for these requirements, and (4) measure the use of automatic data processing resources and report on their performance. (See pp. 23 and 24 for additional recommendations.)

MANAGEMENT AND PLANNING PROBLEMS HAMPER THE CE-80 COMPUTER ACQUISITION PROGRAM

One of Corps' major initiatives, the CE-80 computer acquisition program, has encountered many problems. Nonetheless, the Corps continues to plan for automatic data processing activities which involve a large expenditure--$1 billion--over an 8-year life-cycle (1984-91). Special top management attention is essential if the program is to be properly planned and directed.

Serious planning and management weaknesses raise doubts that the CE-80 computer acquisition program will provide the most effective and efficient way to meet future requirements. For example, the Corps still does not have a well-documented user requirements study--the critical first step in any major computer acquisition. (See p. 37.)

Further, the Corps has not developed adequate plans for converting or redesigning

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software associated with the program. For example, plans have not been developed to determine the software applications that should be redesigned or deleted. Also, it has not resolved major issues regarding its largest software system, the standard Corps of Engineers Management Information System. Management inaction on redesigning this system is symptomatic of the overall planning and management weaknesses. The Corps needs to better define user requirements to determine the extent this major information system should be redesigned. Consequently, any benefits to be achieved from redesigning the information system will be further delayed and users will be forced to continue with an outmoded and inefficient system.

GAO notes that the CE-80 project management office has recently made some improvements in planning the acquisition of computer systems. The project's charter delineating the CE-80 program's mission, authority, and responsibility, coupled with its planning initiatives, should contribute to the success of the program. However, the Corps needs to better define its information needs and improve its analyses to obtain cost-effective information resources.

GAO recommends that the Secretary of the Army direct the Chief of Engineers to:

--Systematically update and define functional user requirements to (1) better justify the acquisition of additional computer resources, (2) evaluate alternative acquisition strategies, and (3) determine requirements for communications and software.

--Perform a detailed review and analysis of major software systems to determine whether they should be continued, redesigned, or eliminated.

--Conduct a thorough cost/benefit analysis of alternative redesign strategies for the Corps of Engineers Management Information System to assure that the Government incurs the lowest total life-cycle cost. (See p. 38 for additional recommendations.)

AGENCY COMMENTS AND GAO'S EVALUATION

The Corps generally agreed with the report but disagreed with certain specific comments, conclusions, and recommendations. The Corps contends that GAO documented some old problems for which solutions have been initiated, but that its report did not sufficiently recognize these actions. While GAO is aware of the Corps' planned, ongoing, and completed corrective actions, GAO believes that these actions represent initial steps and do not go far enough to correct identified deficiencies.

Department of the Army comments and GAO's evaluation of them are on pages 24, 25, 38, and 39. Agency comments, in their entirety, are included in appendix I.

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ABBREVIATIONS

ADP	automatic data processing
COEMIS	Corps of Engineers Management Information System
GAO	General Accounting Office
GSA	General Services Administration
IRM	information resources management

CHAPTER 1

INTRODUCTION

Responding to a January 23, 1981, letter (see app. II) from the Chairman, Subcommittee on Energy and Water Development, House Committee on Appropriations, we reviewed how the Army Corps of Engineers planned, managed, and acquired information resources, specifically automatic data processing (ADP). The subcommittee had monitored the Corps' planning and management of ADP resources and its plans for a major hardware replacement procurement, known as the CE-80 program. The subcommittee was also reviewing the Corps' various procurement actions designed as interim solutions to its immediate hardware problems. Specifically, the subcommittee requested that we provide answers to the following questions.

--What is the current status and cost of ADP resources in the Corps of Engineers?

--Does the Corps have an effective management control system for its ADP resources?

--Is management control and conversion planning for computer software adequate?

--Does the CE-80 computer hardware acquisition program provide an effective and efficient approach to meeting future requirements?

--How should interim data processing requirements be accomplished?

THE CORPS RELIES ON INFORMATION RESOURCES TO MEET ITS MISSION REQUIREMENTS

As a major command within the U.S. Army, the Corps is responsible for a wide range of civil and military engineering missions. The Corps' civil programs are directed at managing and developing the Nation's water resources and improving rivers, harbors, and waterways. Its military missions involve engineering support and construction for all types of facilities and structures, such as military installations, airfields, roads, and bridges.

The Corps' mission effectiveness depends on information resources. In addition to raw data and computer equipment, information resources include (1) the computer and associated technology that process the data, (2) the software systems that transform the data into useful information for decisionmaking

and carrying out program objectives, (3) a nationwide telecommunications network that sends and receives information, (4) the in-house personnel who perform and manage various data collection and data processing activities, and (5) the contractors and consultants who provide technical expertise. Also, automated applications have become more complex, up-to-date information is required more frequently, and more accurate engineering designs are required within a shorter time. Scientists and engineers as well as administrative personnel consider these resources necessary for carrying out their functions and providing information for decisionmaking. Faced with accomplishing more work with fewer people, Corps officials see the computer and other information resources becoming an even more important resource in improving productivity.

INFORMATION RESOURCES THE CORPS USES

During fiscal year 1980, the Corps spent approximately $100 million to acquire, operate, and maintain its computer facilities and other ADP resources. This included about $10 million to obtain ADP services from commercial sources and another $5 million for services provided by other Government agencies.

The Corps operates 57 data processing installations in divisions, districts, research centers, and laboratories located throughout the United States and foreign countries. Until recently, most Corps divisions have been using outmoded General Electric or Honeywell computer systems. The Corps' districts and smaller divisions have been operating either obsolete General Electric computers or more modern Harris minicomputers. The laboratories and research centers as well as many districts and divisions also have various remote terminal devices, telecommunications equipment, and minicomputers which are devoted to special purposes.

The Corps' information systems are used to support administrative, scientific, and engineering applications. Approximately 300 standard application systems support administrative functions, and an estimated 10,000 applications are available in the Corps to assist scientists and engineers in structural and architectural designs, research projects, and problem solving.

The standard Corps of Engineers Management Information System (COEMIS) was established in 1968 and has three primary subsystems.

--A finance and accounting subsystem, which contains district level accounting records for civil, military, and revolving fund accounts, supports financial reporting requirements Corps-wide.

--A personnel administration subsystem provides a data base for staff management requirements and authorizations.

--A resource allocation and project management subsystem reports project management information available in the personnel and finance and accounting data files. It also furnishes management information needed to plan and execute projects and programs.

Other examples of computer applications the Corps uses to support its programs and missions include:

--A transportation information system which provides the capability to collect, analyze, and evaluate data for a variety of planning applications, such as evaluating navigable inland waterways.

--A civil works information system which provides management information pertaining to recreational resources, planning and construction, monetary authorization by river basin, the Civil Works 5-Year Construction Program, the status of civil works planning studies and property, and flood plain management.

--A computer-aided engineer and architectural design system which provides enhanced design quality and responsiveness for military construction projects.

--An automated military construction progress reporting system which reports project design and construction responsiveness.

--A progress reporting system for receiving, consolidating, and maintaining progress reports from Corps district offices.

PLANS TO IMPROVE INFORMATION RESOURCES

To improve its information resource capability, the Corps has been planning the replacement of computer hardware (CE-80 program) over several years. This long-range planning began in 1974 and is expected to be completed in 1984. With an overall objective of competitively replacing obsolete computers at many of its data processing installations, the Corps has planned to acquire minicomputers for its divisions, districts, and laboratories and plans to establish a large centralized host computer facility with an interconnecting telecommunications network. The long-range plan to replace computers is the primary objective of the CE-80 program. According to the Corps' latest budget estimates, the CE-80 program's life-cycle 1/ costs will be in excess of $1 billion for the 1984-91 period. About 75 percent of

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1/Life cycle is the period of time that will elapse over the useful life of the resources being acquired under the CE-80 acquisition program.

this amount, or $786 million, includes the cost for new ADP equipment and maintenance, initially constructing a large host computer facility at a single location, and modifying existing facilities at most other locations to house the new computer systems. In addition to the program's direct costs, the Corps estimates that at least $250 million will be needed for software and the personnel involved in the systems' development, maintenance, and use.

To alleviate hardware limitations until the CE-80 acquisition program has been completed, the Corps recently completed two interim acquisitions. One was to replace General Electric computers and to upgrade the Honeywell computers in operation at the division level. In the second procurement, the Corps acquired 21 Harris minicomputers to replace General Electric's equipment at district offices. The General Electric computers being replaced have been out of production since the late 1960's and early 1970's.

OBJECTIVES, SCOPE, AND METHODOLOGY

The review was performed in accordance with GAO's "Standards for Audit of Governmental Organizations, Programs, Activities, and Functions." We conducted our review pursuant to the January 23, 1981, request of the Chairman, Subcommittee on Energy and Water Development, House Committee on Appropriations. Our objective was to assess the Corps' management, acquisition, and use of information resources, specifically ADP. We concentrated on the extent Corps planning and management practices apply to civil and military engineering missions. In addition to visiting the information--ADP--offices at Corps headquarters in Washington, D.C., we visited 18 of the 57 districts, divisions, and laboratories using computer systems. We also evaluated ADP planning and utilization documents from 40 ADP installations and offices. At these locations we interviewed top-level managers, ADP personnel, and various ADP users to obtain information about ADP management, hardware needs and acquisitions, software needs and responsiveness, and management tools and techniques. We reviewed applicable Department of the Army and Corps of Engineers regulations, Department of Commerce's Federal Information Processing Standards, policy statements, and the Corps' planning documents and equipment justifications. We also used cost estimates obtained from Corps justification documents.

The criteria we used to evaluate the Corps' effectiveness in performing ADP planning and management functions consisted of generally accepted Government and industrywide management principles applicable to such critical resources as personnel, finance, and natural resources. Current literature in Government and industry include information--ADP--resources on the list of critical resources. Without these resources agency mission and program objectives cannot be accomplished. In addition, we relied on ADP management guidance available in GAO, the Office of Management and Budget, the General Services Administration (GSA), the National

Bureau of Standards, as well as the Corps and the Army. We also reviewed reports prepared by congressional committees and analyzed information contained in prior GAO and Corps reports.

In examining ways to improve the Corps' management of ADP resources, we reviewed the application of the Paperwork Reduction Act and the information resource management concept. We reviewed the mandates of the act and the policies and procedures related to the Corps' implementation of the principles of the act and information resource management. Both the act and the concept focus on centralizing and integrating information-related activities, including ADP. They address the following six categories: (1) ADP and telecommunications, (2) records management, (3) paperwork control, (4) privacy, (5) statistical policy, and (6) public information collection and reporting.

Documents obtained from the cognizant Federal agencies that provide Government-wide guidance in IRM/ADP-related matters and the applicable laws and regulations form the basic criteria for this area. Accordingly, we used this as part of the criteria to evaluate the effectiveness of Corps' management, acquisition, planning, and use of ADP resources.

Finally, because the Corps is a part of the Department of the Army, we examined the authority and responsibilities of both organizations in terms of the Paperwork Reduction Act and information resources management issues. We reviewed the Army's plans to implement the act and information resource management concept throughout the Department in addition to the direction it provided to the Corps.

CHAPTER 2

THE CORPS NEEDS A COMPREHENSIVE MANAGEMENT PROGRAM FOR INFORMATION RESOURCES

The Corps has not been effectively managing its information--ADP--resources. Its organizational structure and management approach have not been providing the necessary mechanisms (planning, control, and direction) to assure that these resources are efficiently and effectively used. Although the Corps has established a central office which is responsible for managing data processing resources, this office has not been effective because it has no clear authority to carry out this responsibility under the Corps' longstanding, decentralized management philosophy. The Corps does not have a formal oversight mechanism to help manage its information systems and has not established effective procedures to control and coordinate software and system development activities. It has not implemented a comprehensive planning process to help acquire, manage, and use ADP resources and has no uniform method to monitor the use of computers and related resources and provide management reporting on their performance.

As a result of this ineffective organizational structure and management approach, deficiencies continue in the use of ADP resources. For example, many information needs and requirements are not being satisfied and Corps managers have to depend on outdated, unresponsive, and inefficient information systems and software. The Corps' decentralized management approach to ADP systems development has resulted in a proliferation of software applications being developed locally at districts, divisions, research centers, and laboratories dispersed throughout the Corps. Also, many planning and management weaknesses hampered the Corps' efforts to acquire needed equipment under the CE-80 computer acquisition program.

The Corps needs stronger central direction and a comprehensive management program for information--ADP--resources. The Paperwork Reduction Act of 1980 can serve as a useful framework for strengthening the Corps' management of these resources. The act calls for each agency head to appoint a senior official to be responsible for carrying out information resource activities, including ADP, in an efficient, effective, and economical manner; uniform and consistent information management polices; and a strengthened and centralized information management activity. The authority and responsibility of the senior official would include establishing policy, providing guidance, exercising oversight and management control, and evaluating effectiveness. Although the Army and not the Corps is required to appoint a senior official for information management, we believe the Corps can materially improve its planning, control, direction, and accountability for

managing ADP resources, if it develops an effective and well-organized management structure by appointing a senior official for this purpose.

THE CENTRAL ADP MANAGEMENT OFFICE DOES NOT PROVIDE ADEQUATE DIRECTION AND LEADERSHIP

The Corps' organizational structure does not provide adequate central direction and leadership for managing ADP resources. A central office is responsible for managing ADP, but its authority has not been clearly established. As a result, no single official can be held accountable for managing these resources. In practice, ADP management responsibilities are widely dispersed. The central office has provided little overall guidance and has not developed well-defined policies and direction for ADP.

Authority of central ADP management office is unclear

Under the Corps' decentralized management philosophy, authority and accountability for managing ADP resources has not been clearly established. At its headquarters, the Corps established a central ADP office, the Engineer Automation Management Office, to be responsible for managing and planning ADP resources, but it did not provide a clear mandate for strong central management. In fact, ADP management responsibilities are widely dispersed among the central office, program offices, and field offices in the various divisions, districts, research centers, and laboratories. For example, each of these offices is responsible for the life-cycle management of administrative systems and scientific and engineering computer applications. The Corps has no single management office which is held accountable for managing these resources.

Historically, the Corps' basic management philosophy has been to permit its widely dispersed organizations to manage, acquire, and use computers and related resources such as computer software and ADP personnel for their individual goals and objectives. They have been allowed to manage these important resources independently, with little or no involvement by the central office. For the most part, field offices manage and use ADP resources with differing management styles and techniques and focus on their individual needs without adequately considering Corps-wide requirements. Although decentralized operations provide ADP support where the users are located, there is a requirement for central direction and management to meet agencywide needs. To illustrate, some offices have aggressively applied computer technology in meeting their program objectives, such as telecommunications and computer terminals. Other offices continue using outdated procedures and systems, including less efficient data entry equipment and processes. Likewise, some offices have augmented their ADP capabilities by obtaining outside services such as timesharing, while others continue to use less effective and efficient in house

ADP systems. As a result, lack of uniformity has made central management efforts very difficult, if not impossible. Central office personnel view their primary responsibility as that of helping the ADP users obtain the computers and other information resources needed to support program missions and goals. The office has exercised no oversight function to ensure effective management and use of these resources. Furthermore, its authority to carry out such an oversight role is not clear. This condition results in fragmented, less efficient and effective approaches to providing ADP services.

Central ADP management office has provided little policy guidance and direction

Rather than establishing its own ADP policies or tailoring Army policies to meet Corps needs, the central ADP office generally passes on the Army's policies to ADP users. Frequently, the same approach is used for Army regulations and procedures. For example, the Army's basic regulation governing most of the Corps' ADP activities, including hardware, software, telecommunications, and personnel, is contained in Army Regulation 18-1. This regulation is directed to a very broad spectrum of activities and contains many essential planning and management principles the Corps needs.

The Corps' central office has prepared little guidance on how to apply this direction from the Army. The lack of central direction resulted in inconsistent and incomplete requirements analysis to justify the need for additional computer capability. ADP managers at the local level are forced to interpret these voluminous regulations on their own. They are also expected to comply with ADP policies issued by GSA, the Office of Management and Budget, the National Bureau of Standards, and other Federal agencies. With the Corps having numerous ADP activities dispersed worldwide, the end result has been inconsistent, incomplete, and ineffective compliance with proven concepts and good planning and management practices. The Federal standards and guidance, including Army regulations, call for uniform, well-documented justifications prior to acquiring computers and related resources. However, our review of documents from approximately 40 ADP installations and offices disclosed that these standards and guidelines were not applied. Thus, as pointed out in the available Government guidance, the absence of a uniform and well-documented justification provides no assurance that computer systems to be acquired will meet the needs of individual users or satisfy agencywide requirements.

Well-defined policies and measurable objectives are the foundation of an effective system for managing information resources. Although the Corps is required to follow the policies established by the Army, we are concerned that the Corps has not developed specific policy beyond that which the Army and other Federal agencies dictate. Too many issues are left to interpretation at all management levels and no mechanism exists to ensure

that the policies are followed. The limited guidance issued by the Corps is highly fragmented, and many officials believe that they should be consolidated into a single policy handbook. For instance, there is little central direction in the area of measuring computer performance. As a result, computer hardware and software are not enhanced to the extent they should be, which leads to premature acquisitions and replacements.

MANAGEMENT OVERSIGHT OF INFORMATION SYSTEMS IS WEAK

The Corps has no oversight mechanism for managing its information systems; consequently, many information needs and requirements are not being satisfied. For example, because overall guidance and direction for managing these systems are lacking, individual offices throughout the Corps develop, implement, and manage their own information systems without the benefit of central management and technical expertise. And, what few efforts have been made to provide direction have been ineffective. To illustrate, changes were made to the finance and accounting subsystem--one of the major subsystems of COEMIS--that affected other subsystems. However, the Corps did not evaluate the impact of these changes on the total system or its other subfunctions. According to Federal guidance, good ADP management practices call for a complete evaluation of such impacts on all components of a system. Also, the affected subsystems should be modified accordingly and tested for accuracy and completeness. Further, the dispersed organizational units have developed conflicting plans and policies, resulting in overlapping controls of information systems and duplication of data collection activities. For instance, changes in input data and input controls for COEMIS subsystems have not been coordinated as called for in existing Government guidance in this area. The result is an inaccurate and incomplete information system.

Many questions about the Corps' information resources cannot be answered easily. For example, as in many agencies, no single Corps office knows what information is available; where it is located; who uses it; how it can be shared; or how much it costs to collect, store, and process. By not managing this information as a critical resource, data that is collected and reported through the management chain is not timely or useful as it should be.

In reviewing administrative information systems, the Corps' St. Louis office conducted a Business Systems Planning Study in October 1980, reporting that:

--Management information systems do not provide managers adequate information.

--Managers do not receive consistent information for decisionmaking.

--The type of information required for reporting is often not adequate for project managers.

--Information is not managed as a resource.

--The Corps is not structured to control information as a resource.

We believe that these are common problems throughout the Corps and have persisted over many years. These problems were also noted in the various locations we visited. Several district and division offices stated dissatisfaction with COEMIS. These officials said that information needed locally is scattered throughout several voluminous COEMIS reports, making it more costly and difficult to obtain timely and useful information. Also, field offices stated problems resulting from a poor interface between various COEMIS subsystems--resource allocation/project management and finance and accounting. According to Corps officials, procedures are available for users to surface problems and to request assistance as needed. However, we noted that users have not routinely followed these procedures to remedy the problems.

MANAGEMENT CONTROL OVER SOFTWARE AND SYSTEM DEVELOPMENT HAS NOT BEEN ADEQUATE

The Engineer Automation Management Office provides little guidance and direction over software and system development functions. Its Engineer Automation Support Activity has been assigned the responsibility for standard Corps-wide software systems, including COEMIS. This responsibility includes exercising management control over development, maintenance, and conversion of software (information system) throughout the agency. Further, this activity is responsible for providing technical assistance to field and headquarters offices involved with software projects. Yet, this activity has limited its scope to maintaining standard Corps-wide software systems. Moreover, it has made little progress toward improving the efficiency and responsiveness of the Corps' largest information system, COEMIS. Further, the central office has exercised little control over system development efforts conducted locally at districts, divisions, and laboratories dispersed throughout the Corps. The Corps needs to implement uniform procedures to ensure effective control and avoid the problems frequently encountered in systems development.

COEMIS not adequately meeting information requirements

COEMIS was designed to support basic administrative functions such as finance and accounting, personnel, resource allocation, and project management; however, it has many known deficiencies in providing timely and useful information to users. Officials from the Engineer Automation Management Office said that prior to the recent computer acquisitions, COEMIS, which includes three major subsystems, accounted for over 50 percent of the data processing performed by the Corps on its in-house

computers. COEMIS was implemented over 10 years ago and has been augmented frequently to meet increasing information needs at all levels. For example, improvements have been made in the financial and accounting segments of COEMIS, such as installing teleprocessing directives; using interactive terminals as source data entry systems to update funds on a real-time basis; using interactive terminals for labor input, queries, and ad hoc reporting; and reducing computer run time. Because COEMIS does not meet the needs of field offices, these local offices individually develop information systems to obtain information for decisionmaking. Users representing the personnel and finance and accounting subsystems said that COEMIS does not provide useful and timely information. Further, system changes were not adequately tested prior to implementation. This resulted in system failures. In addition, computer-based files within the resource allocation and project management subsystems have interfacing problems. As a result, costly and time-consuming approaches must be expended to modify the system and to produce needed information.

In a 1976 letter report to the Secretary of Defense, 1/ we reported that COEMIS was being augmented by locally designed programs to meet local information needs and that several users were not receiving adequate management information from COEMIS. We recommended that COEMIS be fully reevaluated with an objective of developing a formal and comprehensive plan specifically addressing milestones and costs, adequacy of information being provided to division and district managers, effects of computer system saturation, and alternate designs for an improved system. We also recommended that the Corps consider a new design for the system to make it operational on modern computers and more responsive to user needs. The Corps, however, has not developed a plan to address these recommendations and continues to rely on the obsolete system to support its management information requirements. Although the Corps has yet to make definite plans, it expects to redesign COEMIS beyond 1984, after acquiring computers under the CE-80 program.

Consequently, managers have continued using this outdated, unresponsive, and inefficient system to support important program objectives. Also, the process for collecting, manipulating, and reporting data is outdated. New information technology to better structure computer files and subsystems and to facilitate the retrieval of information has not been utilized by the Corps. It has not taken advantage of improved techniques and equipment to improve data collection and reporting at the data entry and computer processing levels. Division and district managers remain highly dissatisfied with the system because (1) it fails to provide useful information for decisionmaking, (2) needed management information is scattered throughout several COEMIS reports,

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1/Letter report on our review of the Corps of Engineers' Management Information System (LCD-76-119, Oct. 8, 1976).

(3) the interfacing between the subsystems is considered very poor in many instances, and (4) to obtain needed information, local users have had to develop their own software applications, even though the same applications have been developed previously at other locations. For instance, four districts separately developed applications to provide information on permits issued for waterways. A fifth district had a permit system developed by a local organization, and a sixth district had contracted out for the development of a similar permit system. Officials stated that other districts have individually developed waterway permit systems.

Although the Engineer Automation Support Activity is responsible for maintaining COEMIS, it has no authority to initiate system changes. Therefore, its role in managing COEMIS has been largely reactive. According to Corps officials almost all system changes are requested by the functional components such as finance and accounting, personnel, and the civil works and military programs directorates, but little coordination exists between these organizations. This lack of coordination coupled with the absence of central management control over systems changes provide no assurance that the subsystems of other functional components using COEMIS are not adversely affected.

Pressure by these program offices to make system changes has hindered the Engineer Automation Support Activity from properly planning and managing COEMIS. According to ADP officials in this office, COEMIS has evolved into a burdensome, complex, and inefficient system, and little has been done to correct its known deficiencies or to develop plans for its redesign. An information system that has Corps-wide application, such as COEMIS, requires centralized authority and responsibility over the life of the system to assure that agency needs are continually met.

System development efforts are not centrally controlled and coordinated

In addition to developing software systems to augment COEMIS, Corps divisions, districts, and laboratories are also developing local scientific and engineering applications to provide the engineers with information needed to plan and manage their programs and projects. An estimated 10,000 such applications exist throughout the Corps; however, little central coordination and control is exercised over the expensive efforts required to develop these applications.

Corps field offices have systems analysts and programers who develop software applications to support their individual needs. Additionally, some local offices have engineers who develop software applications for specialized purposes. These software applications range widely in complexity and have required increasingly more personnel resources to develop and maintain. Nevertheless, the efforts of these local programers

and engineering groups are conducted with little central control and coordination. A critical mass of ADP and engineering personnel perform ADP functions in nearly every district, division, and office. This dispersed ADP activity requires central direction as well as technical assistance from a central office.

Corps procedures require that any software development effort expected to cost more than $10,000 be coordinated with the central headquarters office--Engineer Automation Management Office. However, the Corps has not established a mechanism to ensure that these procedures are followed. Further, local officials acknowledged that they rarely coordinate software development efforts with this management office. Instead, they rely on informal communication among division and district counterparts to coordinate their software development efforts.

District and division officials indicated that many software needs are met through various software libraries the Corps maintains. These libraries contain computer-based information systems for local and agencywide use. These systems from the various Corps libraries are available through a sharing procedure. However, district and division officials said that effective sharing of software has been hampered by inadequate procedures for using these libraries. They also stated that documentation of software systems, especially software developed locally, is poor or nonexistent and that the absence of good, standard documentation severely curtails the conversion of software systems from commercial computers to Corps computer systems.

Given the high cost of converting COEMIS and other information systems, millions of dollars could be wasted due to the absence of acceptable, standard documentation of these systems and associated computer programs. In one example, the Corps developed a software system to be processed at a commercial ADP center. However, the individual who originally developed the software system did not document the system's logic and process for subsequent processing on Corps in-house computers. Since this individual is no longer available, one Corps official said that the additional time and money to convert the system would be significant.

With software development being an expensive, labor-intensive and often very complex effort, the potential for waste resulting from duplication of effort is high. Poor documentation hinders the effective exchange and use of applications already developed, and reliance on informal communications lends itself to missed opportunities to improve operations. Examples demonstrating the Corps' need to oversee and control software development are evident at local divisions and districts.

--Four districts separately developed applications to provide information on permits issued for waterways. A fifth district had a permit system being developed by a local university, and a sixth district had contracted out for the development. Officials stated many other districts have locally developed waterway permit systems.

--Systems to manage merit pay, an emerging requirement, are being developed locally. A division and one of its districts developed merit pay applications separately.

Procedures for software development differed greatly even among divisions supervising districts in various geographical areas. For example:

--One of the Corps' divisions has established a library of local business programs. Yet, each district assigns and controls its own identification codes, irrespective of the other districts. This procedure precludes many opportunities to exchange programs.

--Another division has a committee of users to screen requests for administrative applications for potential sharing. However, such screening was not done for scientific and engineering applications which are the individual districts' responsibility.

--At another division, no procedures had been established to coordinate software applications. Districts were left to develop their own applications without regard to the needs of the division or the Corps as a whole.

With little or no central control and coordination of these activities, the Corps has no assurance its applications software and system development resources are being used effectively and efficiently.

The Corps needs better management controls for systems development

The various computer-based information systems for districts, divisions, and offices have not been efficiently or effectively developed or maintained. Uniform procedures and software standards are required for effective management controls over system development. Developing applications software has become a very high risk and costly activity in data processing. Federal guidance on developing software systems emphasizes the need for proper management controls and procedures to avoid mismanagement, waste, and abuse.

We have reported many times on the problems other Federal agencies have experienced in managing systems development. In a recent report, 1/ we identified the essential management principles that should be followed to avoid the pitfalls other agencies have encountered. We believe the Corps could greatly improve its management of system development activities if the framework of principles and procedures presented in that report are appropriately implemented and applied. In a broad sense these principles call for formal systems planning, top management involvement, and systematic management review and control. Some of the essential elements of management control contained within this framework include:

--Developing comprehensive project plans that address major aspects of the system.

--Involving top management in software development efforts.

--Requiring user participation throughout the development process.

--Assigning project managers as a central point of authority for software development efforts.

--Preparing cost estimates and economic analyses.

--Establishing effective procedures to compare a system's progress against approved cost, schedule, and performance estimates.

--Enforcing established procedures for approving new design efforts or enhancements and modifications to existing systems.

PLANNING OF ADP RESOURCES HAS NOT BEEN ADEQUATE

Although widely recognized as essential for effective and efficient ADP operations, the Corps has not implemented an effective planning process to help acquire, manage, and use its ADP resources. Most ADP planning has been done on an ad hoc basis and conducted largely by outside commercial contractors with little direction from central ADP management. Further, despite its experience with the CE-80 computer acquisition program and past criticism of its planning practices, the Corps has placed little emphasis on planning.

1/"Government-wide Guidelines and Management Assistance Center Needed To Improve ADP Systems Development" (AFMD-81-20, Feb. 20, 1981).

Central ADP office role limited to ad hoc planning, data gathering, and coordination

Although the central ADP office is responsible for formulating data processing objectives, goals, and long-range plans, its authority for Corps-wide planning is not defined. In addition, no comprehensive plan has been established, and the resources and management commitment necessary for proper planning have not been provided.

Lacking the necessary authority for strong central management, the central office's role in managing ADP resources has been limited to conducting ad hoc planning studies, gathering information from the dispersed data processing installations, and coordinating procurement requests submitted by field offices. The central office's emphasis on these limited functions has ignored, to a large extent, the comprehensive role required to effectively plan and manage the Corps' valuable ADP resources. Corps officials said they plan as the need arises. This was illustrated when the Corps determined that outmoded computers should be replaced and computer plans were initiated. However, two important elements of the planning process were not provided. First, the Corps did not have a continuous planning process that routinely addresses ever-changing user requirements or the technological advances available to meet these requirements. Second, the plan was not comprehensive in that it did not encompass all software systems and applications that would be processed on the proposed computers. Nonetheless, these two aspects of planning, in addition to many others, are part of the federally prescribed standards in this computer software area.

Past planning efforts have provided little guidance and direction in managing ADP resources. In this regard, Federal guidance calls for establishing formal mechanisms to

--assure that sufficient ADP resources are available when and where required;

--provide a sound basis to justify procuring ADP resources;

--allow dispersed organizational units to keep the central management office informed of their requirements; and

--make projections of total agencywide ADP resource requirements.

However, we found that the Corps has not been adhering to the federally prescribed standards and good management industry practices.

Probably no better example demonstrates the need to follow good planning and management practices than the Corps' CE-80 computer replacement program. In the absence of a comprehensive

planning process, the Corps has experienced difficulties in establishing goals and objectives, identifying data processing requirements, setting priorities, and providing direction for the CE-80 program. Its planning efforts have typically been made in response to a specific problem or requirement or to congressional interest. For example, the Corps initiated the CE-80 program because of hardware problems and the lack of needed capabilities but did not take decisive actions until the problems reached a crisis level. The Corps prepared various planning documents that were required by the Army. However, this planning was generally accomplished through ad hoc studies, many of which had to be repeated several times. Even though the program has been ongoing for several years, a master plan was not prepared until the Congress expressed interest in such a plan. As a result, outmoded computer hardware and software have been used longer than they should have been.

Other studies also criticize Corps planning practices

Past reviews, studies, and analyses have also criticized Corps' ADP management. The weakness most frequently noted has been the absence of a structured planning program to help manage, direct, and control ADP resources.

A review completed in early 1980 by the House Committee on Appropriations' Surveys and Investigation staff reported some of the major problems facing the Corps. In its report, the staff stated that the Corps' ADP planning and management practices are largely inadequate, particularly for the CE-80 program. In fact, the report recommended that no funds be made available for the CE-80 program until improvements are made in the Corps' planning and management practices.

This same report identified three factors contributing to the Corps' poor and often chaotic style of ADP management. It criticized Corps managers for (1) failing to consider ADP as a major resource, (2) placing excessive reliance on contractors to perform ADP planning, and (3) providing an inadequate level of support and commitment to ADP planning.

Recognizing its computer acquisition problems and planning weaknesses, the Corps established, in April 1980, a central project management office for the CE-80 program and designated a project manager. This project office has recently improved Corps-wide planning for the computer acquisition. In November 1981 the Army approved the System Decision Paper for CE-80 which provided an improved framework to direct and plan the acquisition and increase the involvement of top management.

We also reported on the Corps ADP planning in our 1976 letter to the Secretary of Defense. At that time we stated that inadequacies in Corps planning and management hindered efforts to develop and implement COEMIS.

Despite past criticism, the same problems still exist. Until the Corps develops and implements a comprehensive planning program, past problems, weaknesses, and deficiencies will continue to prevent the efficient and effective acquisition, management, and use of ADP resources. Although Corps officials stated that recent initiatives should correct past planning problems, we still believe more needs to be done in this area.

The Corps should establish a comprehensive planning process

The Corps needs a comprehensive planning process to more effectively manage its ADP and other information resources. This process should provide a formal, systematic mechanism for establishing goals and objectives, identifying and defining information requirements, setting priorities, allocating resources, projecting future requirements, and evaluating performance of ADP and other information resources.

Developing a comprehensive, long-range planning process has long been recognized in industry standards and Federal guidelines as an effective way to (1) achieve efficient and effective use of ADP resources, (2) assure that these resources support agency missions and objectives, and (3) provide needed top management commitment and support for planned actions. For example, the importance of ADP planning is emphasized in the Office of Management and Budget's Circular A-71, "Responsibilities for the Administration and Management of Automatic Data Processing Activities."

The Corps has made efforts to strengthen its ADP planning through its recent implementation of a 5-year projection of ADP requirements. But this program has limited scope and is confined largely to equipment needs and cost estimates. It does not provide the information needed to help the Corps accomplish its program objectives and missions, define information requirements, or set priorities and measurable milestones. For example, plans are incomplete in such areas as comprehensive information requirements, service levels to meet user needs, measurable milestones to accomplish tasks and tracking costs.

A comprehensive, long-range plan is generally the final product of the planning process and should reflect the Corps' strategies, goals, and objectives. It could help ensure that the Corps-wide ADP program meets mission requirements effectively, efficiently, and economically. For example, a Corps-wide plan could be used to identify opportunities for eliminating waste and duplication. In addition, the plan could be a valuable management tool for setting measurable milestones to achieve stated goals and objectives and thus provide a useful means to control ADP activities. A formal planning process would provide a mechanism for top management commitments to specific actions thereby providing needed direction and leadership.

PERFORMANCE EVALUATION OF ADP HAS NOT BEEN ADEQUATE

Acquiring, managing, and using ADP resources is further weakened by the absence of uniform methods to measure and evaluate performance of ADP resources. Management has not had the information needed to properly plan ADP resource requirements, and performance data has been unreliable, inconsistent, and dispersed Corps-wide with no uniform method to collect and use the data in a meaningful way.

Although the Corps' central ADP office has established some elements of a performance management program, these elements have not been consolidated and few reports have been coordinated Corps-wide; nor have reports been provided to top management on a regular basis. The Corps routinely prepares reports containing information on hardware and software use and maintenance costs. This performance data is obtained through management reviews at selected computer facilities and from job accounting reports prepared by most data processing installations. However, according to Corps officials much of this information has been inaccurate and unreliable and has not been collected and reported in a uniform or systematic manner. We found that utilization and cost data for computers reported by the field offices differ from data obtained by the central ADP office. Moreover, the management reviews conducted by the central office do not provide the Corps with reliable performance data. This is because the review team generally did not (1) verify the information reported by the data processing installations, (2) follow any systematic or uniform Corps review guidelines, and (3) perform followup work as prescribed by the available Federal guidance in this area. In addition, our analysis of documents coupled with discussions with officials verified the existence of inconsistent performance data for management's use.

The Corps lacks an effective program to measure and evaluate the efficiency and effectiveness of its ADP operations. Without a comprehensive performance program, the Corps cannot effectively justify future acquisitions of computer hardware and software and exercise needed management control over the use of ADP resources.

Like most organizations, the Corps depends heavily on ADP and related resources to accomplish its mission requirements. A formal and structured performance management program can be very useful in evaluating the effectiveness of these resources. The National Bureau of Standards recognizes the need for a formal performance management program in its Federal Information Processing Standards Publication 49, "Guidelines on Computer Performance Management: An Introducton." Also, GSA addresses the need for developing such programs in its detailed document entitled "Management Guidance for Developing and Installing an ADP Performance Management Program." These publications are only two of many that provide guidance on applying acceptable performance management practices.

Further, these publications emphasize that an important concept in performance management is integrating data collected from various sources within an agency--in this case the Corps--into a formally structured program to measure performance. This data should be the source of regular and meaningful reports to various Corps management levels. These reports, in turn, can become the source for management decisions on planning, operations, and procurement. Such data can serve the functions of operational control and management control and strategic planning. Performance management data can also provide a vital element in an overall information resources management system which is responsive to the needs of top management, users, and information resource personnel. In addition, an effective performance management program for information resources should not be limited to the operation of computer facilities but should be applied to all areas of the Corps' information resources, including hardware, software, and personnel.

EFFECTIVE IMPLEMENTATION OF THE PAPERWORK REDUCTION ACT COULD STRENGTHEN CORPS' ADP MANAGEMENT

In December 1980 the Congress enacted Public Law 96-511, the Paperwork Reduction Act of 1980. One of its primary purposes is to ensure that ADP and telecommunications technologies are acquired, managed, and used by the Federal Government in a manner which, among other things, improves service delivery and program management. The act calls for designating, within each agency, a senior official to be responsible for carrying out the agency's information management activities in an efficient, effective, and economical manner. The principles outlined could form the basis for improving Corps management of its ADP and other information resources.

The act focuses on information resources management

The concept of information resource management (IRM) is emerging in ADP organizations as the focus for managing information activities. This concept has become a framework for planning and providing a more responsive and coordinated information management organizational structure for the Government and the private sector. In brief, the concept is an umbrella which covers the whole range of information activities, including not just data processing but manual systems, communications, word processing, libraries, graphics, external data bases, etc. It is viewed as a way to integrate management responsibilities for the control of information-related activities and related processes. The concept includes the planning and management of information collection and the use and dissemination as well as management of information technologies. The rationale for comprehensively managing information-related activities is that these activities contribute substantially to an organization's effectiveness.

The Congress has a continuing interest in how the Federal Government manages information resources; its concerns led to the passage of the Paperwork Reduction Act. Both the act and the IRM concept focus on centralizing management of information activities. Although the act does not prescribe a specific organizational structure for Federal agencies to follow, its legislative history provides basic guidance.

How can the act improve Corps' management of ADP resources?

The principles outlined in the act could help the Corps correct many of its deficiencies and improve its planning, control, direction, and accountability for IRM.

First, the act emphasizes the basic principle that top-level management oversight and control is needed to ensure that an agency efficiently, effectively, and economically uses its information resources and complies with Federal information policies, principles, standards, and guidelines. Second, the act stresses the importance of centrally managing information resources. It states that this central office should be headed by a senior official and report to the agency head. The office should have a clear mandate and sufficient authority to carry out ADP and other IRM responsibilities. This senior official is expected to have substantial, personal, and daily involvement in managing ADP and other information resources. The third principle is the need for a comprehensive planning process to effectively carry out ADP and IRM responsibilities.

How could the Corps implement the principles outlined in the act?

We believe the Corps should establish a central information management office that incorporates the functions of the current central office for ADP and the CE-80 Project Office. This new IRM office would be responsible for all IRM functions, including ADP. Further, the new office should be established at a high level and assigned authority equivalent to the other program offices to assure that IRM matters receive the same consideration as program requirements. The senior Corps official in charge should be a high-level official reporting to the agency head or deputy, and who can devote adequate and continuous attention to managing the information resource activities of the Corps' highly decentralized operations. The sole responsibility of this central management office should be to manage Corps' information resources. Establishing this separate, central office, headed by a senior Corps official, is further justified because of the importance of information resources to the Corps. As a large diversified organization, with numerous field offices and approximately 44,000 employees, the Corps could not accomplish its mission and programs without information and the supporting resources and technology.

Under the consolidated IRM and ADP approach the Corps' senior official must not only be assigned a strong oversight and management role but must use this authority in providing guidance and direction for managing all information resources, including ADP. A structured management approach would be required to help the senior official carry out the principles of the act. Through this approach the senior official could ensure that needed management improvements are developed and implemented. These include

--a comprehensive, long-range planning process for ADP and other information resources;

--a structured program to monitor and evaluate the use and performance of ADP and other information resources;

--clearly defined policies and objectives regarding acquiring, managing, and using all information resources; and

--effective procedures for controlling and coordinating information systems development throughout the Corps.

In December 1981 the Corps' Information Resources Management Study Group completed its analysis of problems the Corps faces in managing its information resources, including ADP. The group's efforts should help establish a management structure to correct many longstanding management and technical deficiencies and aid in implementing the principles of the Paperwork Reduction Act and related ADP and IRM concepts. Following the group's study, the Deputy Chief of Engineers stated in a December 31, 1981, memorandum the following:

"I approve the establishing of an oversight group which would have the purposes you described for the recommended Information Resources Management Committee in your study."

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"I approve in principle the concept of creating a single automation agency within Headquarters, Office of Chief of Engineers. I would like to see the study group work further, however, toward defining the composition, mission, responsibilities, and relationship to other Office of Chief of Engineers activities prior to final approval."

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"I also approve in principle the establishment of a single activity which would be responsible for information resources within the Corps. Further work needs to be done here also in defining the size, composition, mission, responsibilities in relationship to other activities, etc., prior to final approval."

CONCLUSIONS

The Corps' approach to managing its information resources has not been successful; thus serious problems exist in acquiring, managing, and using these critical resources. Moreover, under the current organizational structure, management responsibility for planning, directing, and controlling ADP resources is fragmented among numerous staff and program offices and field activities. Few policies and objectives have been established for managing these resources, top level management until recently has not been adequately involved, and Corps-wide coordination of ADP requirements is very limited. The lack of an oversight mechanism for managing information systems has resulted in dispersed organizational units having conflicting plans and policies and overlapping management controls over information systems. Long-term needs have been addressed by ad hoc studies only when problems arise; while managers of the dispersed data processing installations have been primarily concerned with ongoing operations. Software and system development have not been adequately controlled, and improvements have been hampered by little central guidance, direction, coordination, and the lack of uniform procedures. Lacking a comprehensive formal planning process and a structured computer performance program, management does not have sufficient information to determine current and future requirements, assess productivity and responsiveness, and measure performance of Corps' ADP and other information resources.

The Paperwork Reduction Act can materially improve the Corps' IRM. Following the principles of the act, the Corps can strengthen central direction and leadership which has been missing from its ADP management process. The Corps' central ADP office, the Engineer Automation Management Office, already has many of the ADP responsibilities under the act and could be organizationally placed under the direction of the senior information resource official, providing the leadership and some of the necessary resources to carry out central ADP management responsibilities. To be efective, we believe all information activities should be consolidated into a single IRM office and would include the functions of the CE-80 Project Office and Automation Management Office. Once a strong central organizational structure is established, efforts should be made to develop a meaningful IRM program, including uniform IRM policies and procedures.

RECOMMENDATIONS

We recommend that the Secretary of the Army direct the Chief of Engineers to:

--Establish a separate information resource management office with clearly defined authority over information resource activities. This office should include the functions of information resources management, the Automation Management Office, and the CE-80 Project Office.

--Direct the senior official to conform the organizational structure, policies, and programs of the information resource management office to those of the Army as they become available.

--Direct staff and program offices and field offices to establish a direct and systematic reporting relationship with the central information resource management office.

--Issue a directive establishing clear authority and responsibility of the senior official for information resource management issues.

--Direct the recently designated senior official to develop and implement a comprehensive program for managing the Corps' information resources. Also, the comprehensive program should include (1) a formal oversight mechanism to guide and direct the use and management of information systems and (2) formal procedures and policies to control software and system development projects.

--Establish a comprehensive planning process for information resources, including ADP. This process should provide a mechanism to (1) establish strategies, goals, and objectives, (2) identify and define functional information requirements, (3) establish priorities for these requirements, and (4) measure the use of automatic data processing resources and report on their performance.

--Develop a comprehensive software plan to facilitate the transition of software systems to a future computer system.

AGENCY COMMENTS AND OUR EVALUATION

The agency generally agreed with these recommendations and stated that actions have been initiated or completed. However, it disagreed with some of the specific comments, conclusions, and recommendations. The following paragraphs provide the essence of the agency's comments and our evaluation of them.

The Corps believed it should have the latitude to organize the Information Resource Management function to best meet its mission and program objectives. We concur as long as the elements of accepted management practices under the Information Resource Management concept are addressed and other actions we recommended to the Secretary of the Army to improve information resource management are accomplished.

In commenting on our first recommendation on establishing a separate Information Resource Management Office, the Corps states that it is establishing an Information Resources Management Office to be headed by a senior manager and directed by an oversight group (executive board). Subsequent to our receiving agency comments, agency officials clarified the function of the newly established subcommittee (executive board) for IRM activities. The

objective of the subcommittee is to function as an advisory group, or oversight forum, to ensure effective development of policy and procedures for information resource activities.

However, we believe that the Corps plan to establish a central IRM office should not exclude the planned Automation Management Office and the CE-80 Project Office. Consistent with the principles of IRM and the Paperwork Reduction Act, all information related activities, including ADP, should be under the management control of a central management office. Further, the senior manager for the IRM office should report directly to the senior official for IRM, the Deputy Chief of Engineers.

Our earlier proposal called for the Corps to designate a senior official for Information Resource Management. Subsequent to receiving agency comments on our report, agency officials clarified the proposed organization for IRM activities. Also, because the Corps designated a senior official for IRM--the Deputy Chief of Engineers--and established an oversight forum, we deleted our earlier proposal calling for the designation of a senior IRM official.

Regarding the other IRM organizational issues, we continue to be concerned that the proposed organizational structure does not (1) establish a Information Resource Management Office at a level equivalent in authority of the highest program offices, reporting to the Chief of Engineers, and (2) consolidate the functions of IRM, the Automation Management Office, and the CE-80 Project Office into a single IRM office.

CHAPTER 3

MANAGEMENT AND PLANNING PROBLEMS HAMPER THE CE-80 PROGRAM

The Corps has pursued the CE-80 hardware replacement program for several years, but it has not been successful in acquiring needed ADP resources. The Corps has encountered serious planning difficulties and has fallen several years behind in its efforts to replace computer hardware at numerous data processing installations worldwide.

Failing to meet the program's primary goal of providing responsive computer support to users, the Corps has been forced to meet its data processing requirements through interim approaches which have often been ineffective and inefficient. Because of the serious computer obsolescence problems and the urgent need to provide responsive ADP support for important programs and missions, Corps management has turned to outside contractors, piecemeal equipment upgrades, and interim acquisitions.

Concerned that these interim solutions will not meet long-range requirements, the Corps is continuing to plan for the CE-80 program. However, its history of planning and management problems and the deficiencies in the CE-80 plans raise serious doubts that this program will provide the most effective and efficient approach to meeting future requirements. Although the Corps has recently taken actions to correct some of the deficiencies, much more needs to be accomplished to ensure that a cost-effective acquisition will result from the substantial expenditure in new computer systems and existing resources--estimated to cost over $1 billion during an 8-year life cycle (1984-91). This 8-year period covers the acquisition, implementation, and operation phases, while the preceding 10-years, starting in 1974, represent the planning phase of the CE-80 program.

PREVIOUS PLANNING EFFORTS WERE NOT SUCCESSFUL

The basic concepts for the CE-80 program, which evolved over several years, were formulated in 1974 with plans to competitively replace obsolete computer hardware. The CE-80 program will provide computers and telecommunications equipment, software, and support services for 57 data processing installations at districts, divisions, and other field offices as well as Corps headquarters. The program also calls for a single, large central data processing center and a communications network to tie all computer hardware together into an integrated system of support services. The Corps plans to acquire computer software, which is the totality of computer programs, procedures, rules, and documentation used to extend the capabilities of the computer hardware. Software helps all users in obtaining information the computer processes. These software

items include a Data Base Management System, applications software, and operating systems software. Under the CE-80 program the Corps plans to obtain (1) contract services to provide processing support over and above in-house capability and (2) facilities management services for equipment operations and source data entry functions.

According to agency officials and documents we analyzed, the Corps has been reviewing its computer applications and programs since late 1973. Although it recognized that it had serious problems with its ADP resources, including computer equipment, software, and personnel, it did little to correct these problems. For example, the Corps' computer equipment had become saturated and had been unable to meet increasing workloads. Further, agency officials told us that equipment failures, obsolescence, and high maintenance costs prevented the Corps from effectively and efficiently accomplishing its ADP-related responsibilities.

The Corps commissioned two commercial contractors to help develop solutions for its ADP problems and to help plan for a major hardware procurement. The first study, 1/ which was conducted in 1976, was limited to predesign stages and only identified a few alternatives for meeting Corps data processing requirements. Recognizing that this study did not adequately justify a major hardware replacement, the Corps hired a second contractor to study its data processing requirements. The second study, 2/ which began in August 1977, focused on detailed technical design and analysis of computer configuration alternatives and the preparation of documents needed for a competitive computer system acquisition. The CE-80 program plan was partially completed in March 1978, calling for releasing a Request For Proposal as early as October 1979.

In late 1978 the Army's Computer Systems Command having approval authority over acquisitions questioned the program's technical equipment specifications and requested additional information. Also, in early 1979, during hearings on the 1980 budget submission, the House Committee on Appropriations questioned the Corps' acquisition plans. In its report explaining fiscal year 1980 appropriations, the committee disapproved funding for acquiring new ADP equipment and precluded the acquisition of new equipment with available funds until a detailed plan was forwarded and approved by the committee. Consequently, the Corps extended the contractor's efforts to help develop the necessary planning documents, thus delaying the program.

In January 1980 the Subcommittee on Energy and Water Development, House Committee on Appropriations, raised numerous questions

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1/Auerbach Associates, Inc., Dec. 1976.

2/Systems Architects, Inc., Mar. 1978 and Feb. 1980.

regarding the CE-80 program during hearings on the Corps' 1981 budget submission. While recognizing the need to replace the aging computer equipment, the committee again deleted funding because it was not convinced that the Corps was ready to proceed immediately with upgrading the equipment. Additionally, the committee criticized the Corps' planning and management of the CE-80 program and called for establishing a life-cycle management approach to ADP acquisition and operations as required by Army and Department of Defense regulations and other Federal regulations.

Following the hearings the committee directed the Corps to:

--Revalidate the computer capacity requirements and establish capacity enhancement procedures that provide for optimal balancing of workload and available capacity.

--Study current workload to determine how much can be phased out, how much can be redesigned for efficiency, and how much will be converted with no major reprograming.

--Evaluate which specific programs/systems will run on a central computer versus those that will run on district or division computers.

--Reevaluate, on a formal cost-benefit basis, the necessity for two central computer sites.

--Develop a request for proposal that includes realistic estimates of costs of acquisition and operation. Also include the costs associated with equipment rental or purchase, program and data conversion, personnel training, equipment maintenance, site preparation, parallel running, etc.

In the House Committee on Appropriations' report on the Energy and Water Development Appropriations Bill for fiscal year 1982, the committee did not approve any procurement funding for the Corps' CE-80 major computer acquisition program. The disapproval was based on (1) the Corps' unsatisfactory response to the committee's previous questions on ADP management and planning, (2) investigative studies available to the committee that demonstrated serious weaknesses in the Corps' overall management of ADP resources, (3) the Corps' inadequate planning and management practices that have contributed to the use of obsolete computer equipment and increased reliance on costly commercial services, resulting in a piecemeal approach to acquiring computer resources and short-term, interim fixes for the obsolete hardware. Because of these problems, the committee concluded that any funding at this time for the CE-80 program would be an unwise investment of taxpayers' money.

PLANNING DIFFICULTIES PERSIST

The Corps is still experiencing serious difficulties in developing important planning documents critical to the CE-80 program's

long-range success. For example, the Corps has not yet (1) adequately defined its functional user requirements, (2) considered all the alternatives available for meeting data processing requirements, and (3) fully analyzed costs and benefits.

Functional requirements not adequately defined

One of the primary reasons the Corps has had problems with the CE-80 program is the lack of a well-documented study of functional user requirements. Throughout its planning for the program, the Corps focused on computer equipment requirements and gave little attention to defining the functional requirements. Consequently, the Corps has been unable to determine how best to support the users' data processing requirements and to adequately justify acquiring new equipment. GSA's Federal Management Circular, FMC 74-5: Management, Acquisition, and Utilization of Automatic Data Processing, establishes policies for ADP resources. It states that determination of the need shall be preceded by and be based upon the results of well-documented general systems and/or feasibility studies for computer acquisitions. Documentation must be adequate to indicate (1) functions or processes are essential and readily adaptable to automation, (2) workload data processing requirements have been revalidated, (3) action has been taken to determine the possibility of comparing the performance of existing data processing facilities through system modifications, rescheduling, software changes, improved work center procedures, and (4) any new systems, procedures, methods to be employed in performing the proposed functions or processes have been designed to achieve the highest practicable degree of effectiveness and operational economy.

Further, both contractor studies of Corps data processing requirements emphasized hardware requirements and failed to adequately define functional user requirements. The first study, completed in 1976, attempted to develop general functional requirements and did identify many of the application systems the Corps used. However, Corps officials acknowledged that this study was incomplete; was not performed on a program-by-program basis; and contained little information describing the functions to be performed, objectives of the applications, characteristics of data processed, or the intended uses. Nevertheless, Corps management accepted the modified general functional system requirements as an adequate description of basic functional requirements for the CE-80 program. Management did recognize, however, that the study presented insufficient justification for the major hardware acquisition. Subsequently, the Corps contracted for the second study which was started in August 1977.

Like the first study, the second contractor study was hardware-oriented and, while substantial efforts were made to identify workloads, little effort was made to define and document functional requirements. The contractor developed requirements data through visits or inquiries to headquarters and field

offices to obtain wide representation of the Corps workload. The study team stated that workload estimates and projections were based on incomplete program description data. This limited the Corps' ability to develop requirements to meet user needs and established a hardware bias. The study made no further efforts to define functional user needs or requirements but rather focused on developing technical equipment specifications. The Corps has modified its proposed hardware concepts at least three times during our review, and additional changes in the computer operational concept are continuing. Without a comprehensive functional requirements analysis, an inappropriate basis for decisionmaking is formed and therefore contributes to the Corps continually changing positions.

Alternatives not fully considered

The second study of workloads attempted to translate all the separate and distinct types of processing requirements into a single computer system. However, the Corps had insufficient information to properly evaluate the available alternatives. Consequently, it could neither determine the most effective and economical alternative for each class of computer service nor select the best overall computer system to meet its needs.

According to Corps officials, while the study identified the various computer capabilities the Corps desired, it did not adequately classify the various types of computer services needed nor analyze workloads for each type of processing. For example, widely recognized user needs, such as graphics and interactive processing (user interacting directly with the computer), were not separately shown and analyzed to determine current and anticipated workload. Also, the officials told us that the primary type of processing currently done in the Corps--batch processing--was not sufficiently analyzed. Under batch processing, work that is submitted to a computer is processed by the computer facility when computer time is available. The user is not interacting with the computer and is not directly involved with the computer process.

Basically, the study considered three broad types of workload--business, engineering management, and scientific and engineering. Further, it considered three general types of computer needs--large central processors, smaller local processors, and a sophisticated communications network. Corps management favored a combination of two alternatives: (1) centralizing most of the workload at three host computer sites, with small minicomputers at all other sites and (2) upgrading each location's computer equipment with modern minicomputers to handle most of its workload.

The contractor pointed out that Corps restrictions on the study had limited the alternatives examined. For example, the Corps limited the extent as well as the number of alternatives the contractor should consider. Placing such restrictions on contractors is not consistent with good management practices. Moreover, information and workload data required to evaluate the suggested alternatives was inadequate. In this instance, the

Corps did not provide detailed information for the contractor to properly evaluate the alternatives, such as:

--A complete list of computer applications appropriately related to the functional programs supported.

--The types of processing--batch, remote batch, interactive, graphics, etc.--required for the applications and justifications for these requirements.

--Processing times by type and in total for the applications.

--The frequency that applications are processed.

--Turnaround or response times needed for the applications and justifications for such requirements.

The Corps, however, had problems obtaining this information, primarily because no uniform methods were available to (1) measure the use of existing computer resources, (2) evaluate their performance, (3) identify performance levels of services needed, or (4) estimate future requirements. Having insufficient knowledge of functional requirements and the current workload, the Corps could not adequately support its selected alternative as being the most effective and economical or even agree on an overall computer system.

Cost and benefits not fully analyzed

Although the CE-80 program called for a new approach to data processing, no cost estimates were included for new software development or redesign of major systems such as COEMIS. For example, the Corps proposed that COEMIS be converted to an online, interactive system with a centralized data base. However, it neither analyzed the expected benefits nor showed how the finance and accounting personnel, resource allocation, and project reporting functions would be affected. Thus, Corps management had no assurance that this approach was justifiable.

The economic analysis developed in the contractor's study did not fully consider all costs and benefits as prescribed by existing Federal guidance in this area. In the cost analysis, for example, we noted the study included an estimate of $1.6 million for converting software to the proposed new computer systems in a 6-month period. Based on Government and industry experience with systems of this scope, we believe the estimated conversion period and conversion cost may be on the low side. Moreover, the Corps officials we interviewed concurred with our views. The study made little effort to quantify or explain the benefits expected from the CE-80 program, and no estimates of dollar savings were prepared. The Corps did not show the effect of improved capabilities on operational and research projects versus the effect of continuing under

the existing systems or using alternatives. To properly evaluate the expected benefits, the proposed investment in new computer systems should have been tied to specific mission and program objectives according to the prescribed method. Also, the increased capabilities proposed by the program should have been reviewed and developed separately for interactive processing, batch processing, graphics, and the various other types of data processing needed by the Corps.

ADP USERS FORCED TO USE INEFFECTIVE AND INEFFICIENT APPROACHES TO MEET REQUIREMENTS

The Corps has been forced to meet data processing requirements through less desirable approaches which have not been effective and efficient. For example, many users throughout the Corps have had to continue using obsolete equipment well beyond its cost effective and useful life. Most users have had to obtain outside data processing support, including expensive commercial services. Also, some computer acquisitions have resulted in piecemeal approaches.

Continued operation of inefficient computer hardware

Several data processing installations targeted to receive new computer systems under the CE-80 program have had to continue using computer equipment which is costly, unreliable, and difficult to maintain. For example, the Corps' largest research and development laboratory, the Waterways Experiment Station in Vicksburg, Mississippi, was forced to support much of its scientific and engineering work with a dual GE-635 computer system which had outlived its economic and physical life. Because of equipment failure, the total system was frequently unavailable to users. The system became so unreliable that users had to seek other means of support.

Since 1978, 5 of the Corps' 10 largest engineering divisions had to continue using outmoded GE-437 computers which had limited capabilities and required costly maintenance. This equipment was acquired secondhand more than 10 years ago and, within a few years of its installation, was incapable of meeting the divisions' workload. With no interactive processing capabilities, the equipment was not responsive to user requirements. Corps officials told us these five computers experienced frequent failures and were difficult to repair because of a spare parts shortage. The manufacturer discontinued producing the computers in 1970, the same year they were installed by the Corps.

Perhaps the Corps' most critical obsolescence problem was having to continue using 20-year-old GE-225 computers to support district offices. According to some Corps officials, these computers were obsolete when first installed in the early 1960's and have been of little use for the past several years. However, because of the unsuccessful hardware replacement efforts, 18 Corps districts have had to continue operating this obsolete equipment despite its extremely limited capability and efficiency. In fiscal year 1980, the Corps spent at least $1 million to operate and

maintain the GE-225 computers but received little computer support. To illustrate, at least two district offices, while continuing to pay maintenance costs, had virtually stopped using their GE-225 computers. One district spent $127,000 over a 20-month period but used the computer only 2 hours each month. Another district reported in 1978 that its GE-225 computer was a $66,000 annual liability that could be avoided by upgrading existing remote terminal equipment but initiated no further action to implement the alternative and was still paying for unused equipment.

Increased reliance on outside computer services

With the equipment becoming more obsolete and the delays in the CE-80 program continuing, many Corps users are forced to seek outside computer services to meet data processing requirements, especially those related to scientific and engineering programs. The users' reliance on outside support has increased substantially over the past several years to the point that an estimated 65 percent of the Corps' total data processing workload is being accomplished under contract with commercial firms, other Government agencies, and universities. Overall, the Corps is using about 50 different outside sources to obtain computer support and has almost 200 separate service agreements.

According to Corps officials, this situation is highly undesirable because

--this type of computer support is too costly;

--it requires more personnel, both data processing and functional, than the Corps can afford; and

--the large number of different machines, services, and agreements make standardization difficult, if not impossible.

The largest part of the Corps' outside work was obtained from commercial computer service centers. Since individual divisions, districts, laboratories, and other Corps organizations usually made their own contractural arrangements for these services, little central control has been possible and total expenses are difficult to estimate. Available data indicates, however, that reliance on commercial services has increased rapidly and, according to some estimates, was costing the Corps more than $10 million annually by 1981. For example, the Corps estimated it spent over $4 million in fiscal year 1979 under GSA's Teleprocessing Services Program contract with Boeing Computer Services. By April 1981 the Corps estimated that its annual expenses under this one contract would total almost $7 million.

According to Corps officials, extensive effort has been made to meet data processing requirements through time-sharing arrangements with other Government agencies. However, they contend that most of these arrangements are less than satisfactory because of

the support and priority problems involved in obtaining remote computer services.

The support obtained from universities has been relatively small and generally involves highly sophisticated modeling and simulation programs conducted for research and development projects. This work must be done outside, however, because of the Corps' limited in-house computer capabilities.

Piecemeal approach to acquiring computer resources

Beginning in 1976 the Corps resorted to a piecemeal approach to acquiring needed computer resources. For example, the Corps made several piecemeal acquisitions to replace the obsolete GE-225 computers at various district offices. While these acquisitions achieved some improvements, they did not provide the computer support needed to meet all the districts' requirements. In efforts to replace the obsolete GE-437 computers, the Corps acquired five Honeywell 66/20 computers on an interim, sole-source basis to meet emergency requirements at some of the division offices. But, these computers did not fully meet user requirements and subsequently had to be upgraded. Also, as discussed previously, five other division offices had to continue using the obsolete GE-437 computers 4 years longer than necessary. Moreover, Corps headquarters had to continue operating another GE-437 computer for software development and testing. This condition forced headquarters to maintain two separate versions of software applications used on both the GE and Honeywell computers.

As another example, the Waterways Experiment Station obtained a large, advanced scientific computer to help support its research and development programs until the CE-80 program could be implemented. Agency officials indicated that this computer system proved costly to operate and maintain, resulted in a substantial waste of funds, and ultimately had to be released, forcing users to increase their reliance on outside services.

RECENT PROCUREMENTS WERE MADE TO MEET INTERIM REQUIREMENTS

With additional delays expected for the CE-80 program, the Corps recently conducted two major equipment acquisitions, both designed to meet interim data processing needs. As with the CE-80 program, however, the Corps experienced many planning and management difficulties in finally achieving these interim solutions. One of these procurements, a noncompetitive acquisition of modern Honeywell computers, will allow the Corps to release the remaining GE-437 computers and replace the worn out GE-635 at the Waterways Experiment Station. The second procurement, a competitive acquisition of minicomputers for 21 district locations, will allow the Corps to release the remaining obsolete GE-225 computers and reduce its reliance on outside commercial services.

Equipment upgraded at divisions and the Waterways Experiment Station

The Corps study of alternatives available for replacing the outmoded GE-437 computers and the documentation prepared to justify procuring new Honeywell equipment were inadequate. For example, the documentation supporting the selected alternative was inadequate because cost information was incomplete, benefits were not explained, the need for the increased capabilities of the new equipment was not defined, workload data was not quantified, and other available alternatives were not evaluated.

Corps officials concurred that these planning inadequacies existed and, through various meetings and related correspondence, provided additional information which indicated the selected alternative was the best available under the circumstances. The House Committee on Appropriations allowed the Corps to proceed with the procurement, and in June 1981 the Corps signed a contract leasing interim equipment from Honeywell at an annual cost of approximately $1.8 million. The procurement alternative selected included (1) a one-for-one replacement of GE-437 computers with a Honeywell 66/20 at four division offices and (2) replacing both the GE-437 and 635 computers at the Waterways Experiment Station with a Honeywell DPS-1 computer (a larger version of the Honeywell 66/20). This alternative also allows the Corps to release the GE-437 computer used at headquarters for software development and testing. The Corps' analysis showed this alternative was the most economical approach to replacing the GE-437 computers because these upgrades did not require costly and lengthy conversion efforts.

Minicomputers acquired for district offices

The Corps also had planning problems in acquiring minicomputers for its district offices. Its original justification for acquiring the minicomputers was the poor performance and high cost of maintaining the outdated GE-225 computers. However, the Corps presented little evidence identifying specific work to be performed by the proposed new minicomputers. According to Corps officials, the increased capabilities of the minicomputers were needed so that workload currently supported on commercial and other Government time-sharing services could be brought back in-house and processed more economically. Yet, the Corps had neither identified what workload would be accomplished on the new equipment nor demonstrated that expanded in-house computer operations would be more economical. Subsequently, the Corps reevaluated its equipment requirements and estimated the dollar value of new work and the amount of data processing work each location would bring back in-house to be performed on the proposed minicomputers. The Corps' revised analysis indicated a need for minicomputers at fewer locations, resulted in adjusting the equipment size for some locations, but showed a need for minicomputers larger and more costly than

initially specified. Our reservations regarding the analysis are as follows:

--The Corps analysis was directed at justifying the procurement on economics alone, with little or no evidence for establishing and validating functional user requirements and determining the best way to satisfy them.

--The cost reduction expected in returning work from various outside computer systems to the proposed minicomputers did not accurately reflect total cost for the Corps or for the Federal Government.

--The analysis did not consider the expanded data processing capabilities that were planned to be provided through the acquisition of additional Honeywell computers to process some of the district's work.

--The analysis did not fully consider the cost and time associated with processing large workloads in-house.

--The analysis did not fully consider software conversion costs involved in transferring large data processing workloads into minicomputers.

--The use of new applications as justification for interim computers was questionable.

Although we had reservations with the Corps' justification for this acquisition, we recognized the need for more modern ADP capability at the district level. We also noted that the advanced technology available with modern computers would provide Corps users with interactive processing, graphics capabilities, and increased local programing and processing. The House Appropriations Committee shared our position and decided to allow the Corps to proceed with the minicomputer acquisition, provided certain conditions were met. In a May 5, 1981, letter, the Subcommittee on Energy and Water Development, House Committee on Appropriations, imposed the following conditions on the Office of the Chief of Engineers:

--Carefully manage the creation of new systems and programs on unique features that will be acquired.

--Control systems approved at the Office of the Chief of Engineers level to consolidate Corps-wide requirements and computer applications.

--Track actual savings and costs at each district location.

--As part of the budget justification, report to the committee each January on the planned and actual costs and savings, with explanations for significant differences between planned and actual information.

--Monitor actual machine utilization in each district versus available computer capacity.

--Report to the committee each January on the reasons for any significant discrepancies with machine utilization information and the corrective action initiated.

--Carefully structure the complete replacement of Corps-wide computers to be acquired under the long-term CE-80 acquisition program. This structure is to relate the minicomputers' actual utilization and planned workload requirements to the recently acquired minicomputer capacity.

CE-80 PROGRAM NEEDS FURTHER ANALYSIS AND STRUCTURING TO AVOID CONTINUING PROBLEMS

Although the recent interim procurements have substantially increased its in-house computer capabilities, the Corps is continuing its CE-80 computer acquisition plan for replacing most of its general purpose hardware. However, the persistent planning and management problems coupled with deficiencies in the long-range plans for both hardware and software raise serious doubts about the most effective and efficient approach to meeting future requirements. For example, the Corps has not yet taken adequate steps to improve its management of existing information resources. Moreover, it has not appropriately evaluated the current ADP environment, changed significantly by its recent acquisition of new computers, to determine whether a total replacement is still needed. Further, the Corps still does not have a well-documented user requirements study--the critical first step in any major computer acquisition. Finally, the Corps has not developed adequate plans for application software development, conversion, and maintenance. Also, major issues regarding COEMIS have not been resolved. The Corps needs to redesign its largest software system but has not developed an adequate plan for this major undertaking.

While providing substantially increased computer capabilities, the recent interim procurements were not expected to meet long-term data processing requirements. According to Corps officials, the two interim procurements--the Honeywell upgrades for division offices and the consolidated procurement of minicomputers at the district level--were designed to be interim solutions and not to meet long-range requirements. With workload increases and new user demands expected, Corps officials believe the new interim division and district computers will be saturated and unable to handle the workload in approximately 3 years. This is based on the Corps' projections that show continued growth in total workload at districts, divisions, and laboratories. Also, these procurements are viewed as interim solutions by the House Committee on Appropriations which directed that the procurements not be construed as a substitute for the normal replacement procurement which must be better planned and justified.

CONCLUSIONS

Because of the many planning and management weaknesses, the Corps' major hardware replacement program has fallen several years behind schedule. The delays already experienced in the program along with the serious management deficiencies have led to inefficient and ineffective use of information resources. The Corps is now faced with finding answers to these problems and making sure that better plans are developed to meet future requirements. The CE-80 program plans need further development to avoid continuing problems.

Because of the large expenditure--$1 billion over an 8-year life cycle--and the long-term impact, the Corps should improve the planning and management of such areas as developing user requirements, measuring computer performance, developing software systems, and conducting cost-benefit analyses. Management needs assurance that this long-range acquisition plan is responsive to organization and program changes and provides the most effective and efficient approach to meeting future requirements.

RECOMMENDATIONS

We recommend that the Secretary of the Army direct the Chief of Engineers to:

--Systematically update and define functional user requirements to (1) better justify the acquisition of additional computer resources, (2) evaluate alternative acquisition strategies, and (3) determine requirements for communications and software.

--Determine existing computer performance capabilities which have been increased by recent computer acquisitions and evaluate the impact on long-range plans and workload projections.

--Perform a detailed review and analysis of major software systems to determine whether they should be continued, redesigned, or eliminated.

--Conduct a thorough cost/benefit analysis of alternative redesign strategies for the Corps of Engineers' Management Information Systems to assure that the Government incurs the lowest total life-cycle cost.

AGENCY COMMENTS AND OUR EVALUATION

The agency generally agreed with our recommendations and stated that corrective actions have been completed or are underway. The Corps has not agreed with some specific comments, conclusions, and recommendations. The following paragraphs provide the essence of the agency's comments and our evaluation of them.

Regarding our first recommendation to systematically update and define user requirements, the Corps stated that there has been continued progress in defining user and software requirements. Efforts included acquiring contractor assistance to strengthen the definition on a location-by-location basis and initiating a telecommunications study.

We believe significantly more work is required in the software and telecommunications areas. The Corps needs to develop detailed strategies that provide milestones and tasks that address the total software and telecommunications inventory as well as new user requirements. Further, the Corps needs to express its requirements in quantifiable terms and include service levels required by its user organizations.

In commenting on our second recommendation to determine existing computer performance capabilities, the Corps stated that this determination of performance has been accomplished.

We believe that the Corps has not adequately evaluated the computer performance capabilities, particularly the performance of the 21 newly acquired computers for its district offices. Further, the Corps needs a comprehensive computer performance program that continuously provides for enhancements to computer hardware and software and extends the life of these computer components. The Corps also needs to evaluate the impact of software systems currently processed by outside contractors and planned to be processed by the Corps in-house computer and telecommunications systems.

In connection with our third recommendation that calls for the Corps to perform a detailed review and analysis of major software systems, the Corps states that this has been an on-going action. The Corps said that functional users and proponents meet to solve problems on major systems and that the recently acquired computers afforded the Corps the ability to redesign systems.

We believe that the Corps' on-going effort is fragmented and does not include the most cost effective approaches to redesigning, converting or maintaining its complete inventory of current software to meet new requirements. Dispersed offices in headquarters and field offices continue efforts to resolve the software problems without the benefit of central management office direction and assistance. The Corps needs to establish a software management and technical center to provide management control and technical assistance over software activities throughout the Corps. Further, the Corps needs to develop detailed strategies, including measureable milestones and tasks that would address all software that needs to be continued, converted, redesigned, or discontinued.

Mr. Henry Eschwege

of a Project Manager for CE-80, the project for integrated acquisition of General Purpose ADPE services throughout the Command.

The CE-80 Project Office was created in April 1980 as a direct result of ADP acquisition problems. Several errors in facts are included: estimates of costs are not substantiated, and inaccurate observations are made. These inaccuracies were discussed with your auditors on 7 January and, where requested, further documentation was provided by the Corps. The inclosure provides the substance of these discussions as comments to the Draft GAO Report Digest, which includes the multiple recommendations. I trust that the Final Report will correct the oversights and inaccuracies. I believe that the Final Report should recognize the progress and management initiatives taken by the Corps to correct known problems.

In summary, the Corps recognized the problem and is in the process of implementing solutions.

Sincerely,

William R. Gianelli
Assistant Secretary of the Army
(Civil Works)

Enclosure

[GAO COMMENT: Although the Corps established a CE-80 Project Office for planning, the need exists for more comprehensive planning. Moreover, the Corps should develop more detailed strategies necessary to implement broadly stated plans for all software, hardware, and telecommunications.]

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DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

29 JAN 1982

Mr. Henry Eschwege
Director, Community and
Economic Development Division
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Eschwege:

This is in response to your letter of December 22, 1981 to the Secretary of Defense and the accompanying draft report on "Information Resources Management and Planning Deficiencies Persist at the Corps of Engineers," GAO Code 061100, OSD Case #5842.

The report documents conditions previously known to the Corps of Engineers. These problems as well as actions to correct them were discussed with your auditors. The implementation of formal management of information resources is new, involved, and requires study prior to effecting. The continuing problem of ADP management in a diverse, decentralized, and dispersed organization like the Corps of Engineers is not easily resolved. Actions were and are ongoing to correct the deficiencies and improve management.

The Corps conducted a study of its Information Resources Management (IRM) during the period October - December 1981. The study's objectives were to review the organization, the requirements of information resources management and current problems, and to determine actions required. On 31 December 1981, the Corps established a senior level information management oversight group to guide development of a single Automation Management Agency and a single Information Resources Management activity within Headquarters, U. S. Army Corps of Engineers. The concept agrees essentially with the report's intent concerning information resources management and automatic data processing management. The full text of the Corps' Information Resources Management group work as of December 1981 was provided and discussed with General Accounting Office auditors on 7 January 1982.

Having established general agreement with the GAO report, the Corps does not agree on some of its specific comments, conclusions, and recommendations. Further, the report documents some old problems for which solutions had been initiated, but no recognition of these actions was included. Of specific note was absence of acknowledgement and analysis of the Corps' activation

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GAO Digest

The Corps has experienced numerous problems in the management, acquisition, and use of its ADP resources. Its organizational structure and management approach have a number of weaknesses, including

-- no single focus of responsibility or coherent system for managing information resources;

-- no formal oversight mechanism to ensure effective and efficient management and use of information systems and computer software;

-- no enforcement mechanism for controlling and coordinating the development of software applications;

-- lack of a comprehensive planning process to help manage, acquire, and use information resources, and

-- no uniform method for evaluating the use and performance of computers and related information resources.

Corps Comment

During the period October-December 1981, the Corps studied its organization, the requirements of Information Resources Management and ADP problem to determine what actions were required to implement better IRM policy and procedures. As a result of that study, the Corps has:

-- designated the Deputy Commander, through the Corps of Engineers Major Issues Committee (CEMIC) and Subcommittee, the responsible manager for IRM.

-- established a CEMIC Subcommittee, chaired by the Chief of Staff, as the oversight forum to ensure effective development of Major Command policy and procedures for managing information resources.

-- directed the CEMIC Subcommittee to review, validate, and coordinate requirements and establish priorities to efficiently manage information resources.

-- directed the CEMIC Subcommittee to develop and implement a single IRM Office and a single Automation Management Office to control integrated planning, management and acquisition of information.

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-- continued the progress of the CE-80 Project Office in evaluating requirements for and current performance of General Purpose computers.

[GAO COMMENT: These Corps initiatives represent satisfactory steps toward correcting identified problems and deficiencies in Information Resource Management, specifically ADP. Yet, they lack detailed management actions to effectively implement the concepts of Information Resource Management and the principles of the Paperwork Reduction Act of 1980. See page 25 for further discusssion of these issues.]

GAO Digest

The Corps has become increasingly dependent on information resources to accomplish its mission and program objectives. It uses 60 major computer-based information systems to support administrative functions and over 10,000 computer-based applications to aid scientists and engineers in structural and architectural designs, research projects, and problem solving.

Corps Comment

Agree.

GAO Digest

Because of planning and management problems, a major computer hardware replacement program known as CE-80 has encountered difficulties since its inception in 1974. Many funding delays and disapprovals have occurred. The Corps has had to meet its data processing requirements through ineffective and inefficient approaches. The CE-80 program is likely to face continuing problems because the Corps has not developed the comprehensive structure needed to manage the program and has not produced adequate planning documents.

Corps Comment

The Corps has met its data processing requirements inefficiently because it was ineffective in acquiring new equipment. All Corps mission activities supported by ADP were accomplished despite the lack of in-house ADP equipment. Acquisition problems caused the Corps to establish a CE-80 Project Office in April 1980 to comprehensively manage acquisition of a Corps-wide integrated ADP support system. The GAO study does not acknowledge its performance to date. The System Decision Paper for CE-80 was approved by HQDA in November 1981. That document

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is the plan for acquiring an integrated ADP system of hardware, software and communications.

[GAO COMMENT: The Corps concurred with our position that it inefficiently met its ADP requirements and was ineffective in acquiring new equipment. We further note that these conditions have prevailed for many years.

Establishing a CE-80 Project Office and developing its charter represent appropriate steps toward a successful computer acquisition. Yet, the Corps has not developed a comprehensive approach that delineates specific goals and strategies necessary for successfully implementing ADP plans. The Corps' performance to date is further discussed on pages 32 to 37. The approval of the System Decision Paper is noted on page 17.]

GAO Digest

GAO conducted this review at the request of the House Committee on Appropriations which was concerned that the Corps is not adequately acquiring, planning, managing and using information resources.

Corps Comment

Agree. Subsequent to the HAC request for this report in January 1981, the HAC approved in March 1981 the Corps' acquisition of five (5) large computers for its divisions and in May 1981 21 minicomputers for its district offices.

[GAO COMMENT: See pages 36 and 37 for a discussion on the committee's continued concerns.]

GAO Digest

A COMPREHENSIVE MANAGEMENT PROGRAM IS LACKING

The Corps' information resources are dispersed throughout the world and are critical to meeting its missions and programs. Yet, Corps management has not provided needed direction and leadership. A comprehensive management program for information resources is needed to guide this highly decentralized agency.

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Corps Comment

The decentralized management of the Corps, which makes it responsive locally to its users, tailors the support required to local needs. Standardization must be balanced with flexibility. The Corps study, described above, revealed a need for more central management, and actions to serve the need are underway.

[GAO COMMENT: Although the Corps concurred with our view that it needs increased central management, it has not established a central management office for all information resources management functions, including ADP. Instead, the Corps plans to establish two offices, one for Information Resource Management and the other for ADP.

We agree that the Corps needs to tailor its ADP services to local needs. We reiterate that our recommendations do not restrict Corps actions to address IRM/ADP problems. As outlined in chapter 2, implementing information resource management concepts should help the central management office increase its effectiveness in meeting overall mission and program objectives.]

GAO Digest

GAO believes that the Paperwork Reduction Act of 1980, if effectively implemented, offers the Corps an appropriate framework for strengthening its management of information resources including automatic data processing. This act mandates that each agency appoint a senior official with authority and responsibility for ensuring effective and efficient information resource management. To correct long standing management weaknesses, this senior official requires a strong central management office for information resources.

Corps Comment

Agree. The Corps IRM study confirms the strengthening required, and the Corps has implemented changes, including designation of a senior official and the concept of a central management office for information resources.

The senior agency official required by the Paperwork Reduction Act is the Assistant Secretary of the Army (IL&FM). There is no requirement by the act below Headquarters, Department of Army.

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GAO Digest

GAO recommends that the Secretary of Army direct the Chief of Engineers to:

Corps Comment

The Chief of Engineers should not be directed to organize in any specific way but should be given missions and be permitted to use his limited resources to accomplish those missions.

[GAO COMMENT: Our recommendation to the Secretary of the Army provides a framework for organizing an Information Resource Management Office and implementing the concepts of information resource management and the principles of the Paperwork Reduction Act of 1980. This framework allows the Corps latitude as contrasted with organizing in any specific way. Additional comments are discussed on pages 24 and 25.]

GAO Digest

-- designate a senior official, having a rank at least equivalent to that of the Corps' highest level program managers, to be responsible for the effective and efficient management of information resources;

Corps Comment

The Corps, as a result of its IRM Study, has organized an oversight group responsible to the Deputy Commander to direct these activities.

[GAO COMMENT: See page 24 for our evaluation of agency comments.]

GAO Digest

-- establish a separate information resource management office headed by this senior official with clearly defined authority over the information resource activities of the Corps;

Corps Comment

The Corps is establishing an Information Resource Management Office to be headed by a senior manager and directed by the oversight group described above.

[GAO COMMENT: See pages 24 and 25 for our evaluation of Corps comments.]

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GAO Digest

-- direct the senior official to begin immediately to develop and implement a comprehensive program for managing the Corps' information resources;

Corps Comment

The IRM Study Group has reviewed and developed organizational structure conforming to existing Department of Army policy. Implementing policies and programs will be developed to manage information needs.

[GAO COMMENT: See pages 24 and 25 for our discussion on this item.]

GAO Digest

-- establish a formal planning process which provides a mechanism to (1) establish strategies, goals, and objectives, (2) identify and define functional information requirements, (3) establish priorities for these requirements, and (4) measure the use of automatic data processing resources and report on their performance.

Corps Comment

Agree. The above comments describe the mechanism the Corps will use.

GAO Digest

The Corps continues to plan the major CE-80 computer acquisition program which involves a large investment --$1 billion over an 8-year life cycle (1984-1991). Special top management attention is essential if the program is to be properly planned and directed. The persistent planning and management problems raise serious doubts that the CE-80 program will provide the most effective and efficient way to meet future requirements. For example, the Corps still does not have a well documented user requirements study-- the critical first step in any major computer acquisition. Further it has not developed adequate plans for the conversion or redesign of software associated with the program. In particular, it has not resolved major issues regarding its largest software system, the standard Corps of Engineers Management Information System. Management inaction or redesigning this system is symptomatic of the overall planning and management weaknesses. Consequently, any benefits to be achieved from redesigning the information system will be further delayed and users will be forced to continue with an outmoded and inefficient system.

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APPENDIX I

CORPS Comment

THE $1 billion referred to should be called and understood to be "life cycle cost." The order of magnitude is correct, but GAO has not explained how they arrived at the figure. Although large, the CE-80 cost is not additive to current ADP costs. In fact, the CE-80 cost represents a saving of at least 15% over providing the same capability without CE-80.

[GAO COMMENT: Cost estimates are recognized on pages 3 and 4. In essence, about $786 million, or 75 percent, of the $1 billion life-cycle cost estimate is for new equipment and maintenance and for constructing and modifying computer facilities. In addition, at least $250 million is needed for software and the personnel involved in the systems' development, maintainence, and use.]

Planning for and costing of conversion of software is being accomplished in coordination with GSA's Federal Conversion Support Center beginning March 1981.

COEMIS redesign is not in the scope of CE-80. However, it should be noted that there have been continuing improvements to its modules and associated application systems which will be incorporated into a major redesign after CE-80 is implemented. Industry experience supports NOT changing hardware and major application software simultaneously.

[GAO COMMENT: Experience in the Federal Government and in the private sector shows that front-end planning and developmental work begins prior to installing computer hardware. Because of the lengthy lead time usually required for system design, initial phases should begin as soon as possible. Many tasks in the initiation and development phases can be accomplished concurrent with the acquisition of modern computers.]

GAO Digest

GAO recommends that the Secretary of Army direct the Chief of Engineers to restructure the existing CE-80 Project Management Office under the proposed central information resource management office and direct the senior official to--develop a comprehensive structure for managing the CE-80 program, placing special emphasis on the need for top management involvement and user participation; and, providing the resources and commitment necessary to support the acquisition process.

Corps Comment

On 23 July 81, the Commander, USACE, chartered the CE-80 Project Office to provide intensive management to the CE-80 acquisition project, with special emphasis on the need for top management involvement and user participation. Resources and Corps commitment were provided in April 1980 with the Deputy Commander's decision

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to establish such an office. The scope of the Project Manager's charter may not meet GAO's approval, but its intent can not be questioned.

On 31 Dec 81 the Corps created an IRM committee under the direct supervision of the Deputy Chief of Engineers. The committee will ensure user and top management participation in prioritizing goals and committing resources to support the acquisition process. It will also guide the restructuring of automation management including the CE-80 Project Office within the Corps to provide clearer authority and responsibility.

[GAO COMMENT: Based on the Corps' recent actions to intensify top management and user involvement in planning computer acquisitions under the CE-80 program, we deleted our initial proposal in the final report calling for top management involvement.]

GAO Digest

--Systematically update and define functional user requirements to better (1) justify the acquisition of additional computer resources, (2) evaluate acquisition strategies, and (3) determine requirements for communications and software.

Corps Comment

There has been continual progress in defining user and software requirements. In November 81, the Corps began acquisition of a contractor assisted effort to strengthen the definition on a location-by-location basis. Documentation will be available in December 1982. A preliminary communications study was completed in December 1981. A follow-on study to integrate communication requirements for all media Corps-wide, to include data, is scheduled for completion by end of FY 82.

[GAO COMMENT: See page 38 for our evaluation of agency comments.]

GAO Digest

--Determine existing computer performance capabilities which have been increased by recent computer acquisitions and evaluate the impact on long-range plans and workload projections.

Corps Comment

This has been accomplished. Delays to the CE-80 program and serious funding constraints caused the Corps to plan for a longer extension period for CE-80 and longer than anticipated use of interim minicomputers and division mainframes. Existing capability has been reanalyzed and used to determine near-term alternatives.

[GAO COMMENT: See page 38 for our evaluation of Corps comments.]

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GAO Digest

--Perform a detailed review and analysis of major software applications to determine whether they should be continued, redesigned, or eliminated.

Corps Comment

This is and has been an ongoing action. Functional users and proponents meet to identify problems of major systems and identify solutions. Redesign has generally been by change packages rather than total redesign. The addition of more modern inhouse computers has recently afforded the Corps the ability to redesign to capture state-of-the-art capabilities.

[GAO COMMENT: See page 38 for our evaluation.]

GAO Digest

--Develop a comprehensive software plan to facilitate the transition of applications software to the proposed CE-80 computer system.

Corps Comment

Software planning is continuous. In April 1981 functional proponents provided information concerning current systems, proposed functional enhancements and systems under development. These data are being used by the CE-80 and EAMO organizations to develop a comprehensive plan. Also, Functional Systems Plans for military systems are prepared annually under the provisions of AR 18-1. The Corps will expand these plans to include civil funded systems.

[GAO COMMENT: The Corps has not prepared a comprehensive software plan and specific strategies that address the complete inventory of software applications and telecommunication systems. The software plan is long over due and should have provided guidance and direction to all field and headquarters offices many years ago. Such a plan is necessary to accommodate the workload planned for the interim computers and the long-term computers to be acquired under the CE-80 acquisition program.]

GAO Digest

--Conduct a thorough cost/benefit analysis of alternative redesign strategies for COEMIS to assure that the Government incurs the lowest total life-cycle cost.

Corps Comment

Alternate redesign strategies are being addressed by the functional proponents. For example, the Finance and Accounting Steering Group meets three to four times a year. As final alternatives are developed a thorough cost-benefit analysis will be conducted.

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APPENDIX II

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Congress of the United States
House of Representatives
Committee on Appropriations
Washington, D.C. 20515

January 23, 1981

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The Honorable Elmer B. Staats
Comptroller General of the United States
General Accounting Office
Washington, D.C. 20548

Dear Mr. Staats:

The House Committee on Appropriations has been monitoring the U.S. Army Corps of Engineers' planning and management of automatic data processing resources. As you know, the Corps has embarked on a major acquisition program to replace existing computer systems at numerous divisions, districts, and laboratories throughout the country. This program, referred to as the CE-80 Program, has an estimated 8 year life-cycle cost of about $600 million.

It has come to our attention that the agency is proceeding with various procurement actions designed as interim solutions to its immediate hardware problems. While we believe the Corps needs to replace some of its outdated equipment, we are concerned whether these actions are well planned and managed and are based on an adequate determination of ADP requirements.

Accordingly, we request that you conduct a review of the planning, management, and acquisition of ADP resources by the Corps of Engineers and provide the Committee with answers to the following questions:

--What is the current status and cost of ADP resources in the Corps of Engineers?

--Does the Corps have an effective management control system for its ADP resources?

--Is management control and conversion planning for computer software adequate?

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--Does the CE-80 computer hardware acquisition plan provide an effective and efficient approach to meeting future requirements?

--How should interim data processing requirements be accomplished?

It would be most useful to provide the Committee a status briefing by April 24, 1981, and follow up with a formal report of recommended management improvements identified in your review.

We have already asked your Community and Economic Development Division's ADP staff to develop specific questions for the Committee's use during the upcoming appropriation hearings in February.

Your assistance to the Committee is appreciated.

Sincerely,

Tom Bevill

Tom Bevill, Chairman
Subcommittee on Energy
and Water Development

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